

Auburn, Maine Solid Waste Energy
Recovery Project

Brown, Vence and Associates
San Francisco, CA

Prepared for

California State Solid Waste Management Board
Sacramento

Apr 81



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This technical bulletin is one of a series of reports presenting information gathered in visits to resource recovery facilities around the United States. This study effort has been sponsored by the California State Solid Waste Management Board (CSSWMB). As a number of California resource recovery facilities approach the implementation stage, the CSSWMB has recognized the need to learn from existing projects. In late 1980, five sites were chosen and visited by staff members from Brown, Vence and Associates, consultants to the CSSWMB. These sites included both small and large scale facilities, a number of differing technologies, and projects in varying stages of implementation or operation. The subject of this technical bulletin is the Auburn, Maine modular combustion waste-to-energy project.

KEYWORDS: *Solid waste management, *Refuse derived fuels,
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AUBURN, MAINE
SOLID WASTE ENERGY RECOVERY PROJECT
TECHNICAL BULLETIN
April, 1981

Prepared for:

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PREFACE

This technical bulletin is one of a series of reports presenting information gathered in visits to resource recovery facilities around the United States. This study effort has been sponsored by the California State Solid Waste Management Board (CSSWMB). As a number of California resource recovery facilities approach the implementation stage, the CSSWMB has recognized the need to learn from existing projects. In late 1980, five sites were chosen and visited by staff members from Brown, Vence and Associates, consultants to the CSSWMB. These sites included both small and large scale facilities, a number of differing technologies, and projects in varying stages of implementation or operation.

The five sites were:

- Auburn, Maine
- Duluth, Minnesota
- Madison, Wisconsin
- Saugus, Massachusetts
- Akron, Ohio

The subject of this technical bulletin is the Auburn, Maine modular combustion waste-to-energy project.

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INTRODUCTION

The Auburn, Maine refuse processing facility has been designed to receive 200 tons per day (TPD) of municipal refuse and manufacturing waste from the City of Auburn and surrounding communities. The City owns the facility. The technology used in the project involves the burning of refuse in modular, controlled-air combustors, with steam energy recovered using waste-heat boilers. When construction and shakedown are completed (Spring 1981), the plant will produce a maximum of 35,000 lb/hr of superheated steam for sale to Pioneer Plastics, Division of LOF Plastics, Inc. The plant is scheduled to operate 24 hours per day, 5 1/2 days per week.

The City of Auburn, population 24,000, is located in south central Maine. Sited south of downtown Auburn, the refuse processing plant adjoins the Pioneer Plastics factory on five acres of land that Pioneer Plastics sold to the City for \$1.

Sources of waste for the project include municipal refuse from Auburn and more than a dozen smaller communities, manufacturing wastes from Pioneer Plastics, and waste from the Maine Department of Environmental Protection's oil spill cleanup program. Studies are underway to evaluate co-disposal of sewage sludge and of liquid hazardous wastes at the Auburn plant.

The project has evolved in an atmosphere of close and friendly cooperation between the City of Auburn and Pioneer Plastics. The City needed to upgrade its refuse disposal system, and Pioneer Plastics, faced with oil price and supply uncertainties, sought an alternative source of energy for steam generation. Consumat Systems, Inc. has designed, is building, and will operate the facility.

To finance the bulk of the project, the City issued a \$3.4 million general obligation bond. A \$560,000 grant from the Maine Department of Environmental Protection (DEP) helped purchase a fourth modular combustor for use in the oil spill cleanup program. These two sources of money covered the \$3.9 million plant capital cost and some project-related City expenses. Facility design costs were included in a \$260,000 Department of Energy grant. The project will have two major sources of revenue: tipping fees charged to participating communities and steam sales to Pioneer Plastics. The City has projected a positive cash flow for the project after five years of operation.

Auburn procured its project through a competitive negotiation procedure. The City issued a Request for Proposals, evaluated the resulting proposals, and negotiated with the top finalists, before awarding the contract. The agreement with Consumat is essentially a turnkey approach: Consumat is required to design, construct, and operate the plant for three years from the initial date of project acceptance. After this period, Auburn has the option of continuing an operating contract with Consumat, awarding the contract to another firm, or operating the plant with City personnel.

Table i-1 summarizes the basic facts about the Auburn project.

Table i-1

FACT SUMMARY
ENERGY RECOVERY PROJECT
AUBURN, MAINE

Population:	24,000 (1980 estimate)
Shakedown, Startup:	Spring 1981
Principals:	City of Auburn - owner, principal source of refuse Consumat Systems, Inc. - facility designer, constructor, and operator Pioneer Plastics, Inc. - steam purchaser Maine Department of Environmental Protection - principal regulatory agency
Volume:	200 TPD, 24 hours per day, 5-1/2 days per week
Technology:	Mass burning in modular, controlled-air combustors; steam energy recovery in waste-heat boilers
Product:	Steam - 35,000 lb/hr, slight superheat
Costs:	Plant Capital Cost: \$3.9 million Sources: \$3.4 million G.O. Bonds (6.28% avg., 20 yrs.) \$560,000 grant, Maine DEP Design Cost: \$260,000 Source: \$260,000 DOE grant
Revenues:	\$8/ton disposal fee from other communities approximately \$10/1000 lb steam purchase from Pioneer Plastics
Procurements:	Competitive Negotiation; Turnkey (3 year operation)

CHAPTER 1 - PROJECT ORIGIN

IDENTIFICATION OF NEED

Landfill Need

In 1974, regulations were adopted by the Maine DEP requiring the upgrading of land disposal sites by July 1, 1975. Auburn and surrounding communities found themselves faced with both a shortage of existing landfill space and increased attention from regulatory agencies concerning then-current landfilling practices. Six communities, including Auburn, formed a Regional Solid Waste Committee (RSWC) and hired a consultant to identify solid waste disposal alternatives. The consultant's report, presented in May 1975, noted that the cost of upgrading existing open dumps to sanitary landfills would be prohibitive for smaller communities. Two alternatives were suggested: 1) a regional landfill in Auburn, and 2) an energy recovery project involving Pioneer Plastics.

Since that time, the open dumps in the area have been or are being closed, and an interim landfill in Auburn has been used. That landfill is now approaching capacity. Both the interim fill and the original Auburn dump are former gravel pits located near Lake Auburn, which supplies water for the City. Soils in the area are primarily permeable sand and gravel, with intermittent clay lenses and layers. Monitoring of Lake Auburn is ongoing, and no pollution problem has been found. The lake is protected by an underground ridge of hard rock. However, the potential for leachate reaching the City water supply has been recognized by the City and provides further incentive to discontinue landfilling at the present site.

For Auburn, the cost of operating the former open dump was about \$2 per ton. Cost of a new full-size sanitary landfill would have been about \$10 per ton. Present cost of operating the interim landfill is roughly \$7 per ton.

Energy Need

Pioneer Plastics Company is a major energy consumer in the City of Auburn. Their plastics and laminates manufacturing plant uses steam for space heat and process energy. Their average steam consumption is 62,000 lb/hr, with peak consumption in winter of 110,000 lb/hr. The plant boilers are fueled by #6 oil.

In 1973, the oil embargo caused a great deal of concern for Pioneer. Both the rising cost of oil and the uncertainty of its availability led Pioneer management to begin to consider alternative sources of energy. Informal discussions with the City about the use of municipal refuse to produce steam began at that time.

Pioneer participated in early meetings of the Regional Solid Waste Committee in an advisory capacity. The consultant's report of May, 1975, identified Pioneer as the only feasible steam customer for a waste-to-energy project (two other potential customers were also evaluated).

KEY PARTICIPANTS

Each of the parties involved in the project is listed below. Where appropriate, specific individuals and their roles are described. Due to the rural nature of the Auburn region, planning and execution of this project was often much less formal than this outline suggests.

City of Auburn

The City owns the land and the facility, and issued general obligation bonds to finance it. The largest portion (80 TPD) of the feed material to the plant is waste originating in Auburn and collected by the City.

- Robert B. Belz, Director of Public Works; responsible for administration of the facility, refuse collection, and ash landfill operations.
- Charles A. Morrison, City Manager, responsible for the financial aspects of the project, the waste supply agreements with other communities, the contract with Pioneer Plastics, and the contract with Consumat.

Pioneer Plastics

Pioneer is the steam customer and supplies roughly 20 TPD of waste plastic and general plant refuse to the facility. Land for the facility, adjacent to the existing Pioneer steam plant, was deeded to the City for \$1.00. This reduced project cost by eliminating land purchase and by minimizing the cost of the steam line.

- Russell B. Hamor, Vice President - Engineering; attended planning meetings, advised other participants on Pioneer's role, and took part in contract negotiations with the City.

Consumat Systems, Inc.

Consumat Systems, Inc., of Richmond, Virginia, with various subcontractors, has designed and constructed the facility and will operate it for a minimum of three years, after which time the City may exercise its option either to take over plant operations itself, to extend Consumat's operating contract, or to find another operator. Consumat has also prepared a feasibility study of co-disposal of sludge with solid waste in the Auburn plant. The original proposal for the facility was submitted by Consumat in association with E.C. Jordan of Portland, Maine, and Consumat of New England, a division of Global Development Engineering in Salem, Massachusetts.

- Leo Larochelle, Vice President; as Auburn's Director of Public Works through 1978, coordinated all aspects of project feasibility study, planning, permitting, and design. Subsequently responsible for Consumat's involvement with equipment delivery, construction, and startup. Mr. Larochelle now works for Gershman, Brickner, and Bratton in Washington, DC.

Maine Department of Environmental Protection

The DEP of Maine authorizes construction and operation of solid waste facilities and of new sources of air emissions through its permit systems. The agency provided advice and review for the project in the design stage. The DEP will test the facility and will review ash landfill leachate testing when regular operations have begun. The Oil Spill Cleanup Program of the DEP will use the facility for disposal of oil spill waste, and has provided \$560,000 for the purchase of a fourth incinerator unit.

Environmental Protection Agency

The Auburn facility was one of the first to qualify for EPA's Technical Assistance Program. Assistance was provided for RFP preparation, proposal evaluation, and a 1977 report on strategy options for the City, prepared by Development Services, Inc.

Surrounding Communities

Participating communities are listed in Table 1-1. In general, the approach taken by towns near Auburn was cautious at first, with growing interest as the project took shape.

Other Participants

Other participants included various consulting firms: Arthur D. Little; Gordian Associates; Development Services Inc.; Camp, Dresser, McKee; and York Research Corporation. Other companies submitting proposals to build and operate the facility; were: Waste Management, Inc., Envirotech Corporation, Vicon Construction Company and others, ECO Resources Ltd., Lehigh Forming Company, and Pio Lombardi Associates. The U.S. Department of Energy supplied a \$260,000 grant for facility design. The Maine Municipal Bond Bank purchased the bonds issued by the city, then sold an equivalent amount as part of a larger issue.

Table 1-2 lists important dates in the development of the Auburn project.

REGULATIONS AND PERMITS

The principal permitting agency for this project is the Maine DEP. Within this Department, both the Bureau of Air Quality Control and the Bureau of Land Quality Control (Division of Solid Waste Management) have permitting authority. Additionally, the City of Auburn granted building and site permits for the project.

Each of the following paragraphs discusses a particular permit in more detail. References cited in Appendix B provide background information.

Federal, State and Local Regulations and Permits

State of Maine Air Emissions License: The facility was required to apply for an air emissions license under Chapter 108 of the DEP Regulations. Auburn is in the Central Maine Air Quality Region, and the plant location is in attainment for all criteria pollutants. With respect to particulate emissions, the facility must meet an emissions standard of 0.08 gr/DSCF corrected to 12% CO₂.

For incineration facilities in Maine, a feed rate of more than 200 TPD is cause for review under Prevention of Significant Deterioration (PSD) regulations. These are usually more stringent than basic emissions rules. Since the design maximum feed rate is 200 TPD, to avoid PSD review the plant must not be operated beyond design capacity on any day.

The City of Auburn applied for the air emissions license on February 13, 1979. Three modular combustion units were specified; the afterburner (secondary chamber) and cyclones were named as emissions control devices. A license was issued on April 25, 1979. Subsequently, the license has been amended to include a fourth incinerator, and a second amendment has been granted for the use of a more effective stainless-steel fabric baghouse as a pollution control device in lieu of the cyclones.

State of Maine Solid Waste Facility License: In August, 1979, the DEP granted Auburn a license for the "Auburn Solid Waste Energy Recovery Project." The license was modified in March, 1980, to include a fourth incinerator. New solid waste regulations are under consideration for adoption by the DEP; these new rules will show little substantive change from those now applicable to the Auburn facility.

Table 1-1

SOURCES OF WASTE FOR AUBURN FACILITY

Source	Tons Per Day
Auburn	80
Pioneer Plastics	20
New Gloucester	.2
Poland	2-3
Center Lovell	 total approximately 70 TPD
Pineland Hospital	
Lisbon Falls	
Minot	
Mechanic Falls	
Gorham	
Naples	
Mexico (transfer station serving several nearby towns)	
Byron	
Roxbury	
Dixfield	intermittent
Peru	
Rumford	
Maine DEP	

CHAPTER 2 - PROJECT DESCRIPTION

LOCATION

Plant Location

The City of Auburn, is located in south central Maine, approximately 30 miles north of Portland and 30 miles southwest of Augusta, the state capitol (see Figure 2-1). The City of Lewiston lies adjacent to Auburn, across the Androscoggin River. Shoe manufacturing was historically the industrial base of the community; the last 25 years have seen the introduction of other industries as well. Pioneer Plastics, Allied Container, General Electric, and several other new plants have become established in Auburn.

The Auburn refuse processing plant is located south of the downtown section of Auburn, between U.S. 202 and the Little Androscoggin River (see Figure 2-2). It lies immediately adjacent to the Pioneer Plastics factory in an industrial area. A spur of the Canadian National Railroad borders the property and serves Pioneer Plastics.

Wasteshed

In addition to wastes from the City of Auburn, the plant will receive refuse from fourteen smaller communities in the area. Their locations are shown in Figure 2-3. They are expected to contribute about 70 TPD to the facility. Waste materials from the Maine DEP's oil spill cleanup program will also be disposed at the facility, as will waste from Pioneer Plastics. Table 1-1 lists the sources of waste for Auburn's plant.

Pioneer Plastics waste is of three types: general refuse, plastic scraps of various sizes, and plastic sawdust. The sawdust portion will be conveyed pneumatically to the adjacent refuse processing plant. The remainder will be transported by truck.

The City of Lewiston does not plan to deliver waste to the Auburn facility; in fact, the two cities have long managed their solid waste disposal almost independently. However, the two cities will cooperate in that Lewiston's shred-fill will serve as a backup disposal site for the Auburn facility (see Chapter 3, Risk Allocation).

TYPE OF SYSTEM

Modular combustion, using Consumat equipment, forms the basis of the Auburn system. Waste heat water-tube boilers will recover heat from combustion gases, with an extra bank of tubes to give slight superheat (60° - 100° F). A baghouse using bags woven of very fine stainless-steel mesh will provide air pollution control. Ash will be quenched, drained, and hauled to landfill. Figure 2-4 illustrates a modular incineration system.

PLANT DESIGN RATES/SPECIFICATIONS

Processing Capacity

The plant was initially designed for 100 TPD of municipal solid waste, the amount generated by Auburn and Pioneer Plastics. With the addition of other communities and the oil spill waste program, the system capacity was increased to 200 TPD. This amount of waste is to be incinerated in four 50 TPD Consumat units.



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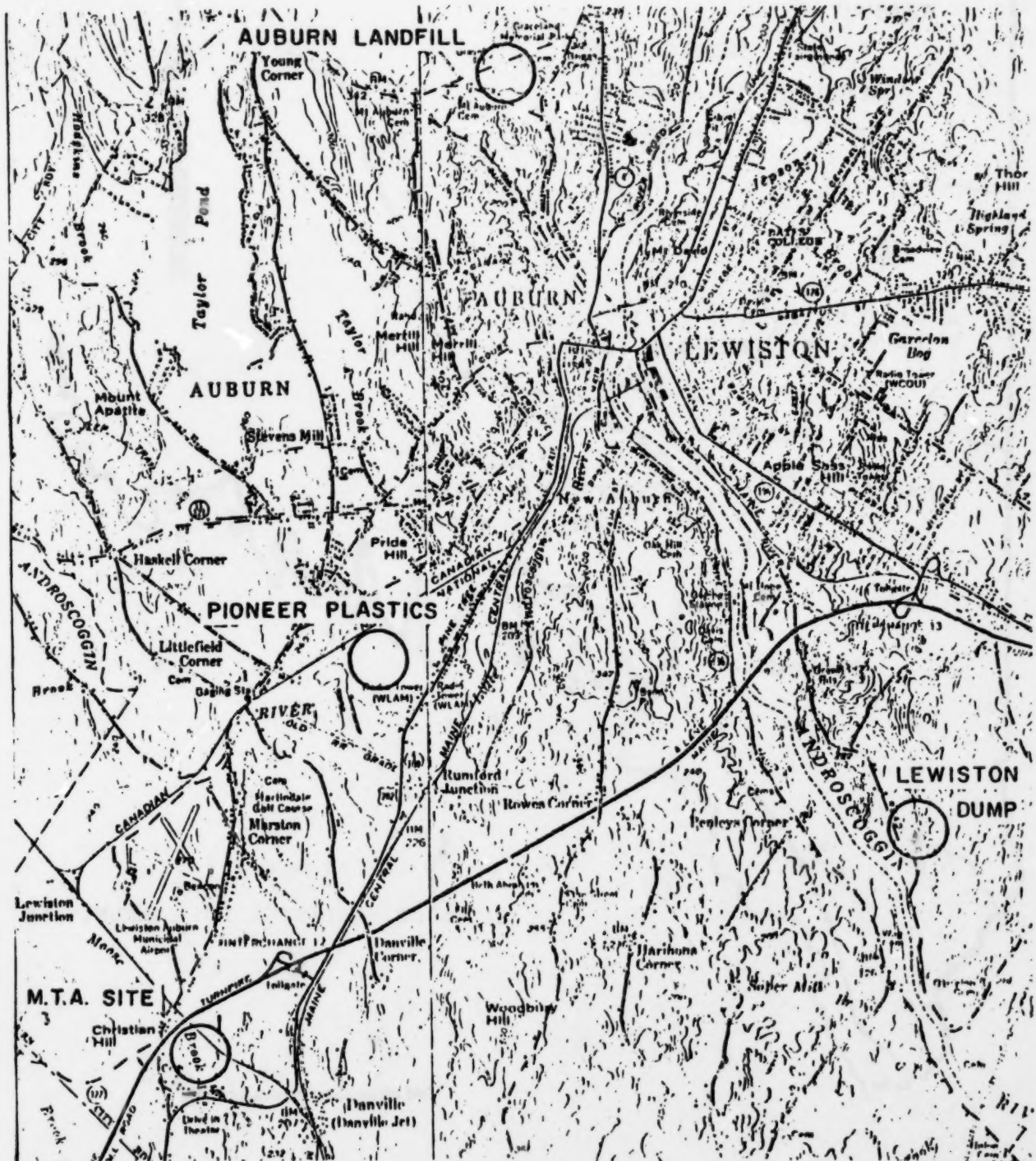
LOCATION OF AUBURN, MAINE

FIGURE

2-1

Figure 2-2

LOCATION OF REFUSE FACILITY
(AT PIONEER PLASTICS)



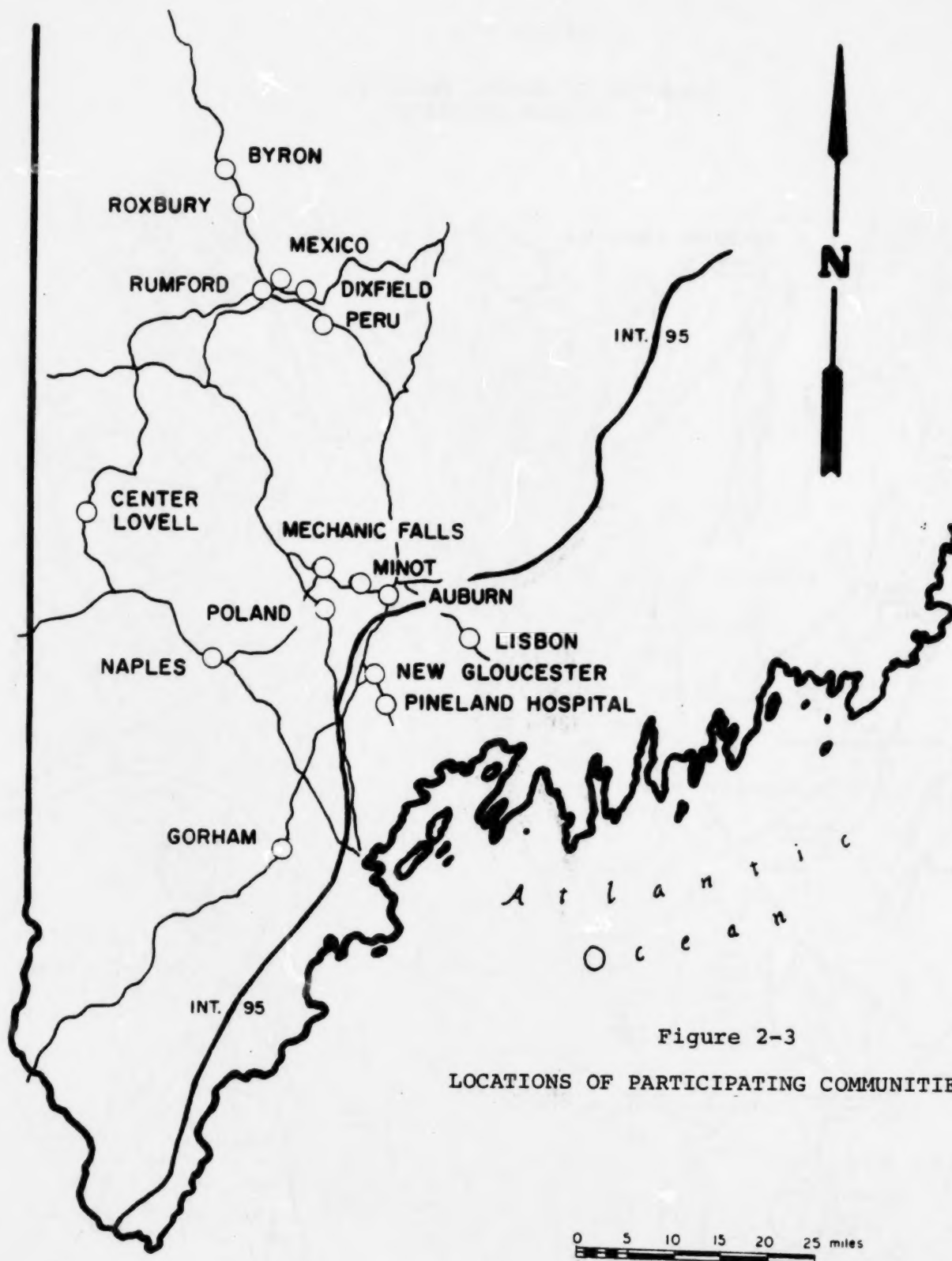


Figure 2-3
LOCATIONS OF PARTICIPATING COMMUNITIES

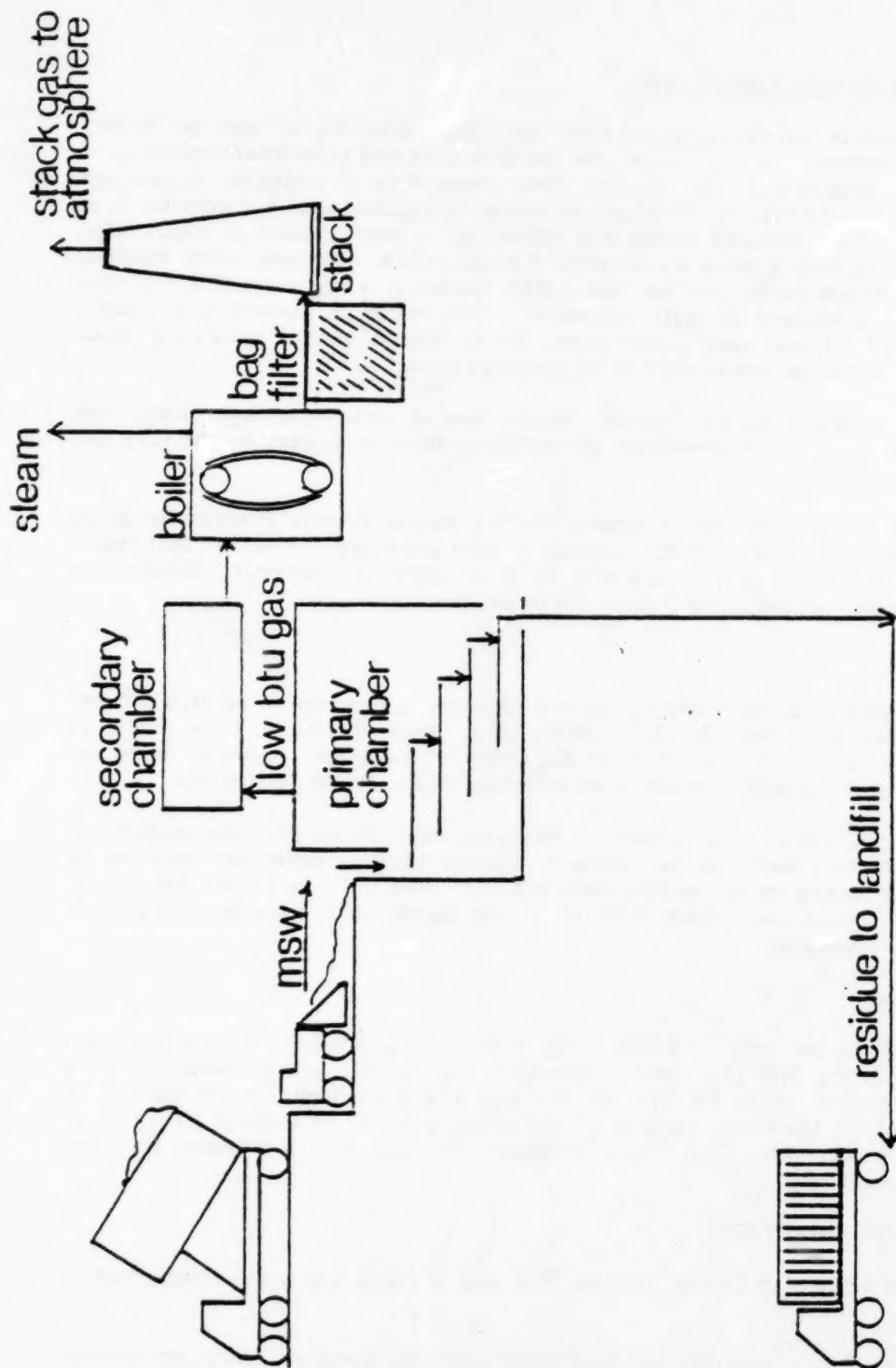


FIGURE
2-4

MODULAR INCINERATION SYSTEM

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Feed Material and Product Specifications

A composition study of residential waste from the Auburn area has not been performed. The Auburn Department of Public Works used national averages to estimate composition and heat value. Analyses of the plastics waste from Pioneer indicated an average heating value of 6835 BTU/lb (as received; moisture negligible), with a maximum of as much as 8500 BTU/lb. Average residential refuse has a heat content of about 4,500 BTU/lb, as received, with a moisture content of roughly 25%. Oil spill waste material will be delivered to the facility by the Maine DEP whenever a spill occurs; it will have been pre-sorted and allowed to drain somewhat. This material, consisting of plastic matting, entrapped oil and water, and other debris, should exhibit a heating value between that for municipal waste and that of plastics waste.

Possible future additions to the Auburn feed material include sewage sludge and hazardous wastes. Both of these options are presently being evaluated by the City and the Maine DEP.

The product from the Auburn plant is steam, which is sold to Pioneer Plastics for space heating and process use. The contract between Auburn and Pioneer specifies that steam will be supplied to Pioneer at 295 psig with 60°F to 100°F of superheat. Condensate return will comprise approximately 50% of the steam flow.

Production Rates

At a 200 TPD feed rate of solid waste, steam production is expected to be 36,000 lb/hr. Average steam use by Pioneer is 62,000 lb/hr; peak usage of 110,000 lb/hr occurs in winter and the minimum, in summer, is 40,500 lb/hr. Pioneer uses steam 24 hours per day. Pioneer presently produces steam from industrial boilers firing #6 fuel oil.

The waste processing facility will operate 24 hours per day. Cooldown, maintenance and startup will be accomplished over the weekend. Pioneer Plastics sometimes operates six days per week, depending on demand for their product; their in-house boilers will still be used when necessary. It is possible that the energy facility will operate some part of Saturday if fuel is available.

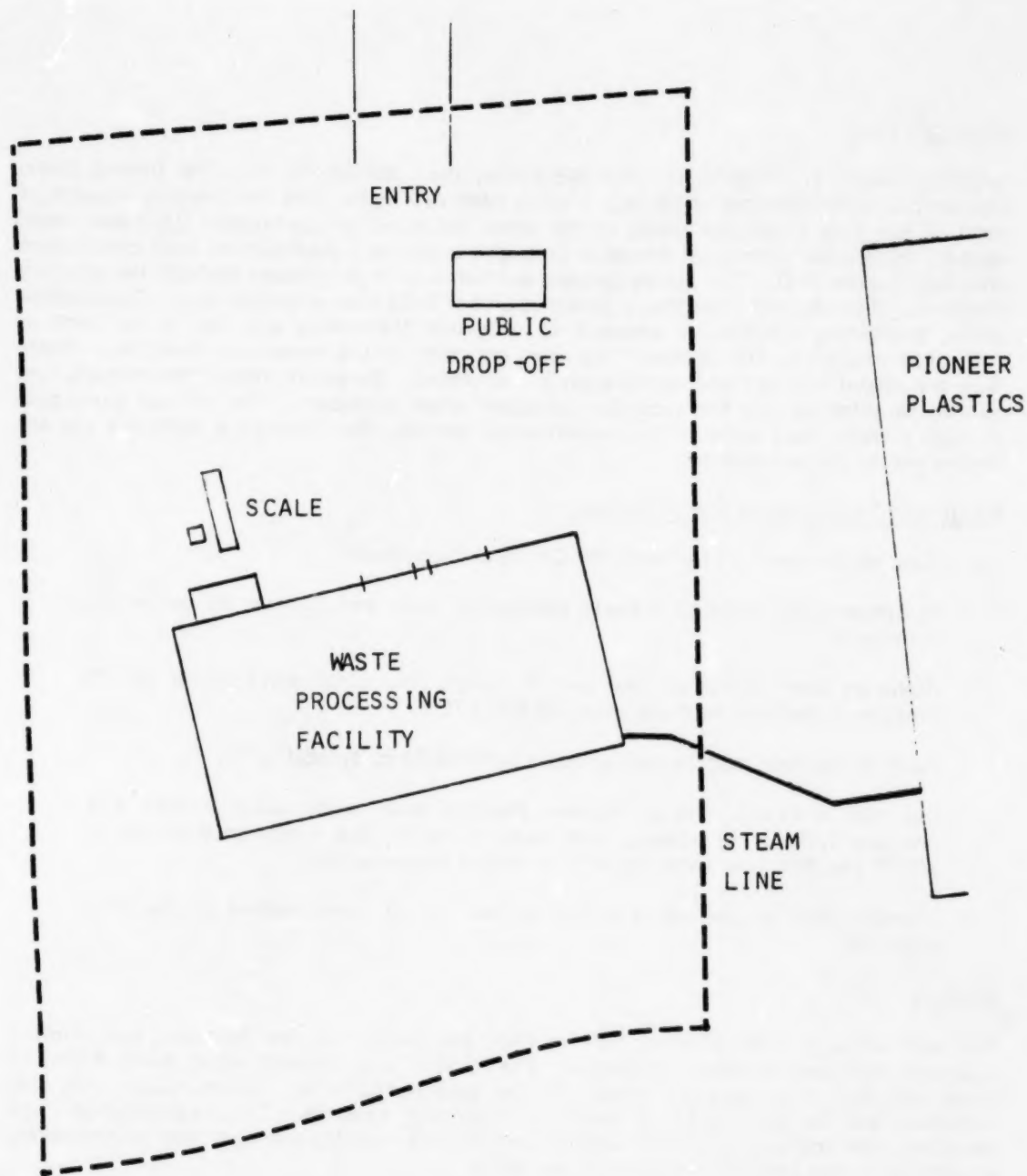
Residue Production

Ash is expected to be produced at a rate of up to 50% of input refuse, or to a maximum of 100 TPD, assuming 200 TPD feed. Ash from the facility will be landfilled at a specially prepared site within the City limits. This site is designed for and expects to receive only ash from the refuse facility. The site has a life of 13 years at a fill rate of 100 TPD, 285 days per year. The City will operate the landfill on land leased from the Maine Turnpike Authority.

PHYSICAL PLANT AND STAFF

Figure 2-5 shows a site plan for the facility. The area of the entire site is approximately five acres.

The public will not be allowed into the main plant building. Local citizenry can drop off refuse in a four-bay enclosure detached from the main building.



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SITE PLAN

FIGURE

2-5

Materials Flow

Incoming waste is weighed at the scale house, then discharged onto the tipping floor. One or two small "Bobcat"-type skip loaders feed raw waste into the charging hoppers of each of the four Consumat units, at the rates indicated by illuminated signs over each hopper. Hydraulic rams push material through the primary chambers of each combustion unit (see Figure 2-6). The refuse ignites and burns as it progresses through the primary chamber. Ash ejected from the primary chamber falls into a quench tank. Combustion gases, containing substantial amounts of unburned flammable gas due to the lack of sufficient oxygen in the primary chamber, proceed to the secondary chamber. There they are mixed with air and combustion is completed. To assure stable combustion, fuel oil may be injected into the secondary chamber when necessary. Hot exhaust gases pass through a waste heat boiler with a superheater section, then through a baghouse and are discharged to the atmosphere.

Equipment Performance Specifications

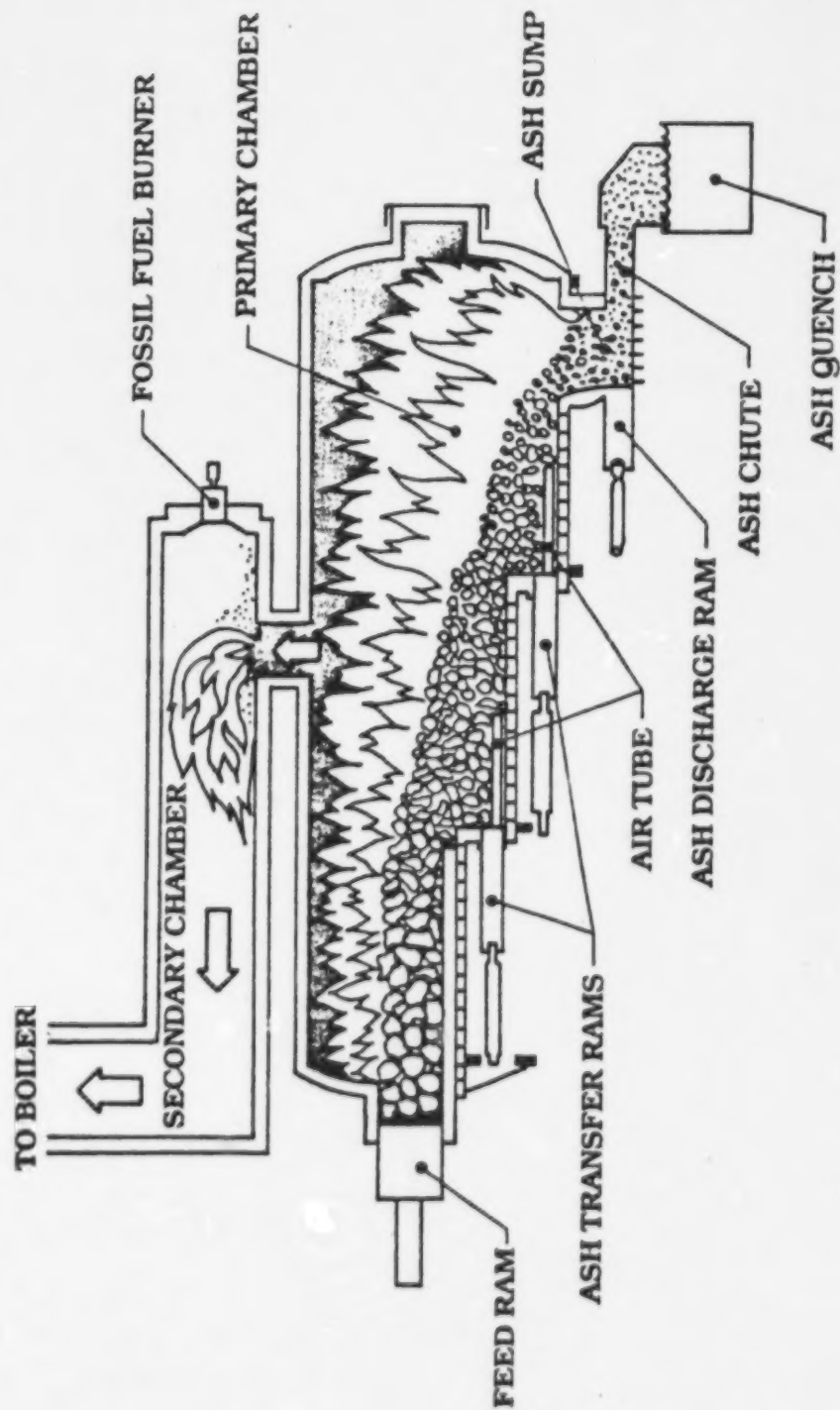
According to the contract between the City and Consumat:

- Equipment will meet or surpass applicable State and Federal air emissions standards.
- Auxiliary fuel consumed per ton of typical municipal solid waste (MSW) processed shall not be more than 500,000 BTU's.
- Each of the four modules will process 4,200 lb/hr of typical MSW.
- Per ton of typical Auburn-Pioneer Plastics solid waste, each module will produce 4,800 lb of steam; feed water is to be 50% condensate return at 200°F and 50% raw water at 54°F or higher temperature.
- Combustibles in the ash will not exceed 5% of combustibles in the feed material.

Staffing

For each shift, a crew of three will be used for operations: one foreman, one primary operator, and one secondary operator. The facility will operate using three shifts, 24 hours per day, 5 1/2 days per week, Monday through Saturday. Maintenance requiring cooldown will be performed on weekends whenever possible. Two maintenance crew members, one scale operator/clerical worker and one facility manager will be employed, in addition to the nine operating crew members.

Figure 2-6
MODULAR COMBUSTION UNIT
(CROSS-SECTION)



CHAPTER 3 - PROJECT FINANCES AND
RISK ALLOCATION

METHOD OF FINANCE

Most of the cost for facility design and construction has been covered by a general obligation bond issued by the City of Auburn. This was purchased by the Maine Municipal Bond Bank (MMBB), a state-established authority, which in turn sold an equivalent amount of bonds as part of a larger issue. By making use of the MMBB, Auburn saved an estimated \$70,000 in bond marketing costs. The Auburn issue was for \$3.4 million, at 6.28% (average) in 1979. The Maine DEP has contributed a grant of \$560,000 to procure the fourth combustion unit. The Department of Energy provided a \$260,000 grant to assist with facility design.

Financing for the Auburn plant was unusual in that costs occurring between bidding and the start of construction were not covered by bond anticipation notes but by DOE grant money and by advances to the project from City funds, which were later repaid to the City from the proceeds of the bond sale.

Costs for major expenses incurred in the course of the project are itemized in Table 3-1. Where known, funding sources are given.

Table 3-1

PROJECT COST SUMMARY TABLE

Cost Item	Amount	Fund Source	Amount
Regional Study	\$30,000	Member Communities of RWSC (prorated by popu- lation Auburn's share covered by the bond issue)	\$30,000
Strategy Options Report	\$15,000		
RFP Prep., Proposal Review	\$25,000	EPA Technical Assistance	\$40,000
Facility Design	\$230,000		
Codisposal Study	\$30,000	Department of Energy Contract	\$260,000
Progress Report	approx. \$5,000		
Land	\$1		
Plant Capital Cost	\$3,281,250	Bond Issue	\$3,400,000
Fourth Incinerator	\$639,372	DEP Oil Spill Cleanup Program	\$560,000
Bond Counsel	approx. \$6,000		

Note: A number of cost items experienced by the City were not available for this report.

FINANCIAL PERFORMANCE

The following discussion reflects plans and estimates, due to the fact that construction is not yet complete.

As the principal party in this project, the City of Auburn has established an enterprise fund to account for project revenues and expenses. This approach was taken to simplify accounting; Auburn is a relatively small community, unaccustomed to operating a project that includes the sale of a product to a customer.

Revenues: Tipping fees are one source of revenue. Communities delivering to the Auburn facility have a choice of seven payment options, of varying rates and durations. The options are:

Option A - 20 yr	\$6.50/ton with 5% escalator each year
Option B - 20 yr	\$8.50/ton, no escalation
Option C - 20 yr	\$8.00/ton, first year. In each succeeding year, pay Auburn's audited per-ton cost for the most recent year completed. Minimum charge \$3 per ton; maximum \$15 per ton.
Option D - 10 yr	\$8.50/ton with 5% escalator each year
Option E - 10 yr	\$11.00/ton, no escalation
Option F - 5 yr	\$10.50/ton with 5% escalator each year
Option G - 5 yr	\$12.00/ton, no escalation

All participating communities have chosen either Option B or C. The City expects its net processing cost to be well below \$8 per ton.

Auburn residents will be allowed to drop off refuse free of charge. Maine DEP will pay \$8.50 per ton for oil wastes processed at the facility.

Sales of steam are the major operational source of revenue. The steam purchase price formula is complex, reflecting the dual involvement of Pioneer Plastics and its parent company, LOF Plastics, Inc. Two alternative prices are developed each month, the lower of which is paid by Pioneer.

The first price formula:

$$\frac{12.18}{BE} \times 1.235 \times 1 + .75 \frac{CMP - BMP}{BMP} = P1$$

where

12.18	=	base month price for fuel oil at Pioneer (\$/barrel)
6.3	=	fuel oil heat value, MMBTU/barrel
BE	=	Pioneer's boiler efficiency (84.4% at current steam production rates)
1.235	=	MMBTU/Mlb steam
CMP	=	current month price for fuel oil at Pioneer (\$/barrel)
BMP	=	base month price for fuel oil at Pioneer (\$12.18/barrel)
P1	=	steam price (\$/Mlb steam)

If the price of oil should drop so that CMP is less than BMP, then 12.18 is replaced by CMP and the factor in brackets is dropped.

The second price formula:

$$\frac{6.36}{\text{BMI}} \times \text{PMI} = \text{P2}$$

where

6.36	=	base price for steam (\$/Mlb)
BMI	=	Consumer Price Index for month before first contract month
PMI	=	Consumer Price Index for month before month being charged
P2	=	steam price (\$/Mlb steam)

The first formula increases linearly with the price of fuel oil, though at a rate of increase that is only 75% of the rate of increase of fuel oil costs. In other words, if the price of fuel oil were to double, the price of steam would increase by 75%. Under the second formula, the steam price increases at the same rate as the Consumer Price Index. Implicit in the use of the two formulas is the assumption that oil prices tend to rise faster than the Consumer Price Index.

The expected steam revenue is on the order of \$24.00 per ton of refuse processed.

Matching steam meters will be installed in the City's facility and at Pioneer to provide a check on steam quantities delivered.

Expenses: For at least the first three years of operation, the City has agreed to pay Consumat a per-ton charge for operating the facility. The base year charge is \$16.52 per ton for the first 25,000 tons of feedstock in a given year and \$8.04 per ton for additional waste processed that year. The payment to Consumat is adjusted each year using the Consumer Price Index. The operator is also paid for steam revenues that exceed the system guarantee. A base steam guarantee for the year is calculated, assuming 4800 pounds of steam produced per ton of feedstock processed. If actual steam generation exceeds this base guarantee, then the operator shares in 25% of additional revenues. This acts as an incentive to promote efficient operation of the plant.

Cost of hauling and landfilling the ash is projected to be \$8/ton. Debt service payments will exceed \$300,000 the first year, then decline as bonds are retired.

Administration of the facility will include Auburn's expenses for billing other communities and Pioneer, payment to the operator, and management of the various contracts associated with the project.

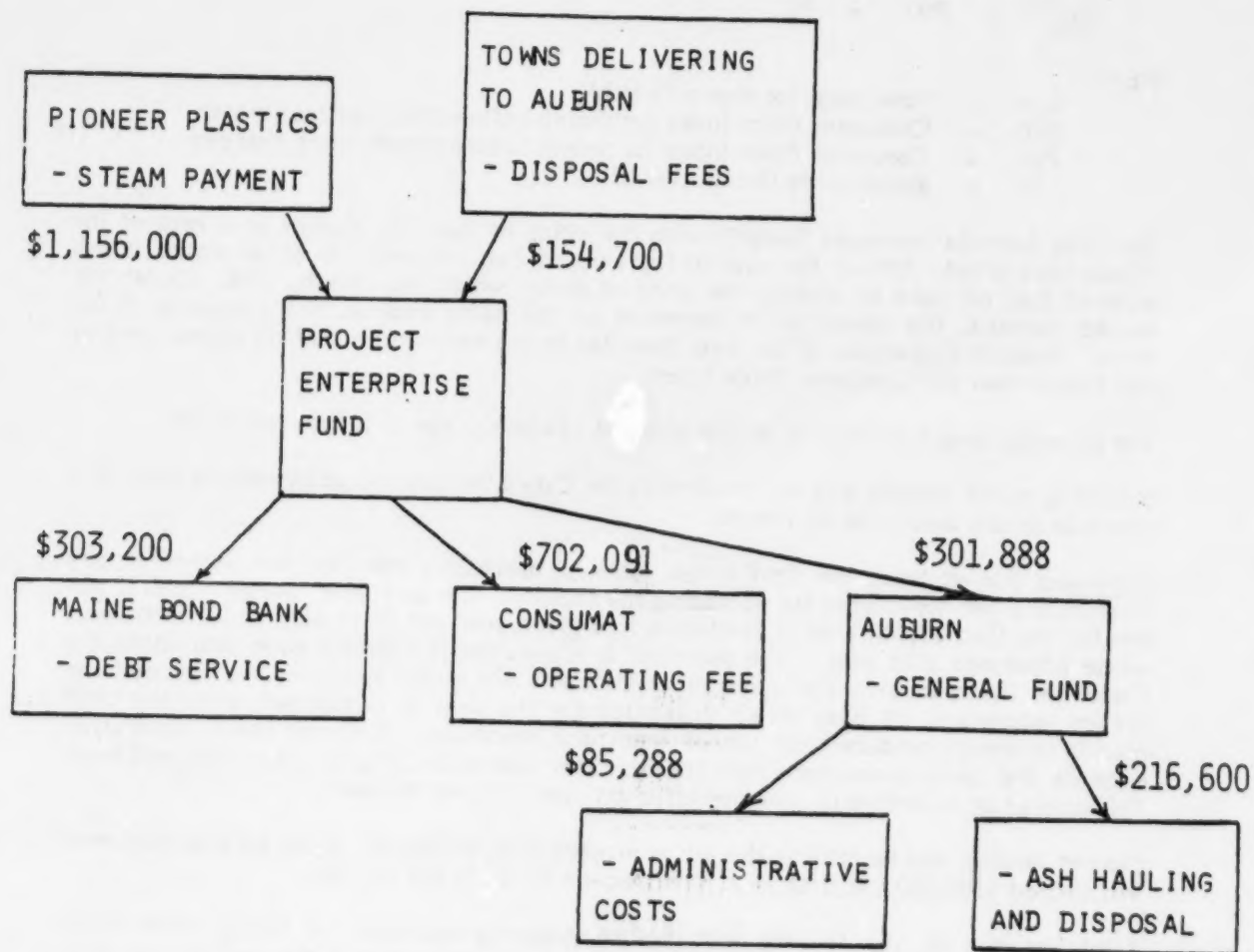
A flow diagram (Figure 3-1) illustrates the transactions described above. The City has prepared a 20-year cash flow projection, which appears as Table 3-2.

RISK ALLOCATION

The Strategy Options report prepared for Auburn by Development Sciences, Inc., provides a thorough discussion of the risks of this project and the means by which those risks have been assigned to, or shared by, the City and Consumat.

Waste Supply

The waste supply agreements with surrounding communities specify a minimum tonnage to be delivered by each community. The communities will pay for disposal of the minimum tonnages, even if the refuse is not delivered.



ASSUMPTION: 52,000 TONS PROCESSED IN FIRST YEAR

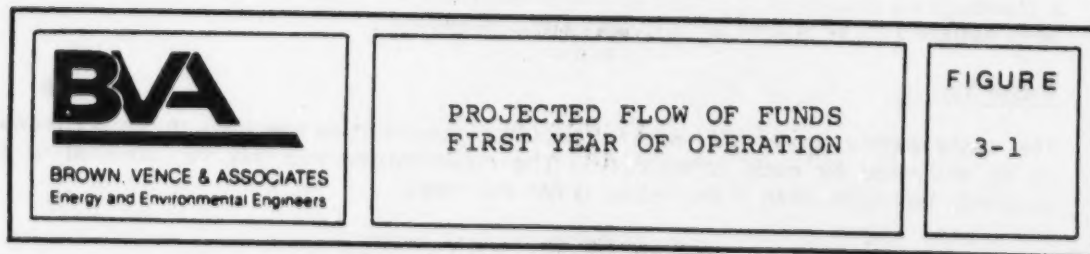


Table 3-2

20 YEAR CASH FLOW PROJECTION

Year	Plant Operating Cost	Landfill Cost ⁶	Administration Cost ³	Total Costs	Steam Rev. ⁴	Tipping Fee Rev.	"Profit" or Loss ⁸
1	\$1,005,291	\$216,600	\$85,288	\$1,307,179	\$1,156,000	\$154,700	\$3,521
2	1,031,472	229,596	88,023	1,349,091	1,146,063	72,800	(130,228)
3	1,039,877	243,372	90,967	1,394,216	1,197,635	74,256	(122,325)
4	998,997	257,974	87,736	1,344,707	1,251,529	75,741	(17,437)
5	1,026,759	273,453	90,755	1,390,967	1,307,848	77,256	(5,863)
6	1,056,839	289,860	94,000	1,440,699	1,366,701	78,801	4,803
7	1,089,372	307,251	97,484	1,494,107	1,428,203	80,377	14,473
8	1,124,522	325,686	101,225	1,551,433	1,492,472	81,985	23,024
9	1,162,426	345,227	105,234	1,612,887	1,555,963	83,624	26,700
10	1,203,258	365,941	109,530	1,678,729	1,629,816	85,297	36,384
11	1,247,193	387,898	114,129	1,749,220	1,703,158	87,003	40,941
12	1,294,417	411,171	119,050	1,824,638	1,779,800	88,743	43,905
13	1,345,126	435,842	124,312	1,905,280	1,859,891	90,518	45,129
14	1,399,532	461,992	129,934	1,991,458	1,943,586	92,328	44,456
15	1,457,854	489,712	135,940	2,083,506	2,031,047	94,174	41,715
16	1,520,329	519,094	142,352	2,181,775	2,122,445	96,058	36,728
17	1,587,204	550,240	149,365	2,286,809	2,217,955	97,979	29,125
18	1,658,745	583,254	156,492	2,398,491	2,317,763	99,939	19,211
19	1,735,232	618,250	164,273	2,517,755	2,422,062	101,938	6,245
20	1,816,960	655,345	172,567	2,644,872	2,531,055	103,976	(9,841)

1 \$8.50/ton (first year cost) x 70 tons/day x 260 days

2 \$4.00/ton average

3 2% growth annually, yr. 3 to yr. 20

4 Based on escalation of oil price at 6% per year

5 City administration and overhead rate of 6.98%, escalated 6%/yr

6 \$8.00/ton for 100 tons per day, 285 days/yr, inflated 6%/yr

7 Operating plus debt retirement costs, variable costs escalated at 6%/yr

8 For each year, "Profit" = Steam Rev. + Tipping Fee Rev. - Total Costs

Energy Market

Pioneer Plastics has agreed to purchase at least 15,000 lb/hr of steam from the facility. If using steam for industrial purposes, Pioneer must take all steam the refuse plant can deliver. Some risk to the City still exists, as project economics are predicated on the assumption that twice the minimum amount of steam will be sold. Auditing of Pioneer's total steam demand is not written into the present contract. As an additional protection to the City, the base price in the second steam price formula is \$1.00 greater (per thousand pounds of steam) than the anticipated cost of steam production. If a cheaper source of steam can be found, Pioneer has the right to call for renegotiation of the steam price. If Pioneer wishes to "buy out" of the project, it is obligated to defray the capital costs of the facility.

Disposal of Residuals

The City has assumed this responsibility and must obtain approval for its ash landfill.

Facility Construction, Operation

Consumat contracted to build and operate the facility.

Project Backup - Lewiston "Waste Bank"

The City of Lewiston also has a shortage of landfill space and operates a shredder in conjunction with its landfill. In the event that the Auburn plant is disabled for a prolonged period, so that it is unable to accept waste, arrangements have been made with Lewiston to accept Auburn refuse at its shreddfill. Auburn will be charged \$7.25 per ton for this service. Moreover, when the Auburn plant is once again operational, it must accept an equal amount of waste from Lewiston, free of charge.

Debt Service

The City places its full faith and credit behind the general obligation bonds issued through the Maine Bond Bank.

CHAPTER 4 - PROJECT EVOLUTION

MODIFICATIONS

Initially, cyclones were chosen as the air pollution control technology. After construction had begun, field tests of similar units indicated that a change in particulate removal device would be needed. A baghouse, containing bags woven of stainless steel mesh, was chosen by Consumat to replace the original, and lower cost, cyclones.

No other modifications affecting plant performance have been made. The weigh scale arrangements may require minor changes so that weigh tickets may be easily handed to drivers, and a major change in scale placement - moving it farther from the main building - may be needed so that trucks do not have to cross the scale at an angle.

SUCCESSSES, FAILURES, REMEDIES

Because the Auburn plant is not yet operating, very little can be said regarding its success (or failure) as a waste disposal facility. However, its success as a planning effort is worthy of some discussion. Several factors were essential to that success, and they are addressed individually below.

Project Coordinator

Any such project, regardless of size, is greatly expedited by one person or office serving to coordinate activities. For a project the size of the Auburn facility, it is possible for one person to act as a general coordinator, overseeing the planning, permitting, design, and financing processes. For the Auburn project, the coordinator has been Mr. Leo Larochelle, former Auburn Director of Public Works. Mr. Larochelle estimates that while working for Auburn, roughly 20% of his time was spent in coordinating the project.

Industry Cooperation

The strong support given to this project by Pioneer Plastics, including sale of land to the City for \$1.00 and willingness to purchase all available steam, provided the necessary financial base.

Agreement Between Parties

In discussions and interviews with people involved in the project, it quickly became clear that none of the parties were taking an adversarial position. Except for LOF Plastics' involvement during contract negotiations, protracted bargaining and re-drafting did not occur. Negotiations between the City and Pioneer have been described as "intense but good-natured." Most individuals involved live in the area and feel a sense of identification with the project, perceiving it as a team effort to solve a local problem. Auburn's willingness to accommodate the desires of the other participating communities is shown by the large variety of options in the waste supply agreement.

The involvement of LOF Plastics, Pioneer's parent company, introduced some discord. After Pioneer had practically completed negotiations with the City, LOF reviewed the contract and insisted on several changes. Although this caused some delay, it was also beneficial to the project, since LOF identified an important weakness in the contract. In the event that Pioneer wished to "buy out" of the project, they had originally agreed to pay an annual fee to the City equal to their minimum yearly steam purchase. LOF found this to be an unreasonably large negative cash flow for Pioneer; "buy-out" terms were renegotiated so that Pioneer is instead obligated only to defray the capital cost of the Auburn facility. Under these terms, the City's risk is still covered.

The second steam price formula, linked to the Consumer Price Index (see Financial

Performance, Chapter 3), also originated with LOF Plastics. These changes were somewhat time-consuming and caused unforeseen delays in the bargaining process.

City Support

During the early stages of the project, the City devoted considerable resources, both in money and staff time, to development. This was done with the understanding that at least partial reimbursement would be available when the City issued the bonds.

Delays

Two significant delays have occurred thus far: first, for a period in 1975, the Auburn Director of Public Works position was not staffed, and the project came to a standstill. In a way, this was of benefit, as important improvements were made in modular combustion system design during that time. The second delay resulted from protracted contract negotiations with Pioneer Plastics, from August 1978 through September 1979, due to a second round of talks with LOF Plastics. As a result of this delay, the escalation of construction costs between the receipt of bids (February 1978) and the start of construction (October, 1979) forced a reduction in the size of the tipping floor, in order to hold costs down.

FUTURE DEVELOPMENTS

The first and most obvious future development is facility completion and startup, currently scheduled for spring 1981. Shakedown is planned through summer 1981, after which routine operations will commence.

Within 180 days of startup, one of the incinerators will be tested for particulate emissions using EPA Method 5. At the same time, the unit also will be tested for emissions of lead, using a method to be developed jointly by Auburn and the DEP. These are conditions of the facility license. Test results will be forwarded to the DEP.

Approval of the ash landfill will be necessary before the facility can operate on a continuous basis. The approval date cannot be predicted at this time.

The approval by Maine DEP of a sewage sludge land disposal site for Auburn is still pending. Ash landfill leachate, if treated at the City wastewater treatment plant, might contribute heavy metals to sewage sludge; therefore, the sludge disposal site may have to meet stringent requirements. Until the sludge disposal site is approved, the ash landfill cannot (theoretically) begin to operate. The City and the DEP are cooperating to assure that collection and monitoring of leachate from the ash landfill will be accomplished. Ground and surface water quality, both on and around the site, will be monitored by the City.

Co-disposal of sewage sludge with solid waste in the Auburn facility has been studied by Consumat and by Camp, Dresser, McKee. The studies are under review by the City and the DEP. Positive results of tests on Consumat equipment in North Little Rock have had a favorable influence toward this approach.

Pioneer Plastics has proposed that a relatively small quantity of liquid hazardous waste generated at their plant be disposed of using the Consumat incinerators in the refuse plant. The DEP will require additional study before granting approval. Ports have been installed in the two outboard combustion units to admit liquid wastes for combustion.

CHAPTER 5 - THE CALIFORNIA PERSPECTIVE

INTRODUCTION

In this chapter, the Auburn project is examined with respect to its viability as a resource recovery project in California. Particular attention is paid to the critical issues of ash disposal, air pollution and the permitting process.

PROJECT LOCATION

The rural character of the Auburn area is most similar to that portion of California north of Lake Tahoe. The Mountain Counties region and the northern Central Valley contain some smaller cities similar in size to Auburn; moreover, the number and size of small towns surrounding those cities provide a close analogy to the Auburn region. Of course, any community with a wasteshed providing roughly 200 tons per day might consider a system such as Auburn's.

ASH DISPOSAL

In California, ash from a refuse incinerator is considered a hazardous waste. This is not presently the case in Maine. Although the Maine DEP and the City of Auburn are carefully designing the Auburn ash landfill to include leachate monitoring and (if necessary) leachate control, the Auburn ash landfill would not satisfy California requirements for a Class I disposal site. It would probably qualify as a Class II-1 site, since vertical movement of leachate is prevented by an artificial barrier. For a similar project, sited in California, one of the following would be necessary to avoid a serious impact on economics due to hazardous waste disposal: 1) close proximity of the project to an inexpensive Class I site, or 2) permitting of the project to dispose of ash in a Class II-1 site.

The large estimate of ash and residue (roughly 50% by weight) is a conservative element of the Auburn design. When the project is operational, ash production will be measured and the economic impact of ash disposal can be more accurately assessed.

AIR POLLUTION

The Auburn project site is in an attainment area for all criteria pollutants. Maine regulations for incinerators consuming more than 50 TPD limit particulate emissions to 0.08 grains per standard cubic foot of exhaust gas (corrected to 12% CO₂). Based on design estimates and test results from similar facilities, highly efficient and/or sophisticated means of air pollution control were not required for the Auburn project. A baghouse using bags of stainless steel mesh was the final choice for air pollution control (see Modifications, Chapter 4).

For a similar facility located in California, air pollution requirements are likely to be more stringent. In a highly urbanized or polluted air basin (Los Angeles and the lower San Joaquin Valley are two examples), a significant increase in project cost could be expected due to additional air pollution control equipment. There is a possibility that only minor refinements would be needed for some areas of California, especially the less densely populated northern portion. Since regulations vary from district to district, a more exact discussion is not possible here.

New Source Review rules require that a new project attempt to find offsets if its emissions will exceed set limits, even with the use of the best available control technology (BACT). Modular combustors are high in NO_x emissions. BACT for NO_x from such units has yet to be specified; it may be the afterburner of the unit itself. However,

recent California legislation (the Calvo Bill, AB 524) exempts resource recovery facilities from the requirement to find offsets when emissions exceed the daily limit if BACT is applied. While this would certainly benefit this type of modular combustion project, the strength of this law has not been tested in the courts; indications are that it will face a strong challenge in the South Coast Air Basin. Further, a prerequisite for permitting will be determination for BACT for NO_x emissions from resource recovery plants.

STATE SOLID WASTE MANAGEMENT AGENCY

In Maine, the state solid waste management agency is the DEP's Bureau of Land Quality Control Division of Solid Waste Management (DSWM). Recent emphasis on the control of hazardous wastes has diverted available staff in all DEP Bureaus from routine duties; the Auburn project has received less attention from the DSWM than it would have under ordinary circumstances. Furthermore, the Department is, in general, understaffed. As a result, the Auburn project has received much less attention in Maine than it would if located in California.

The fact that most state environmental agencies are housed literally under one roof has been, and will continue to be, of benefit to Auburn. From a regulatory point of view, the Auburn project has six components:

- solid waste energy recovery
- air emissions
- ash landfill
- sludge landfill
- co-disposal
- incineration of hazardous wastes

These components interlock: for example, a permit for the ash landfill has been held up because ash landfill leachate would be treated at the Lewiston-Auburn wastewater plant, possibly contributing heavy metals to sewage sludge, and the proposed sludge landfill may be inadequate for highly contaminated sludges. In solving complex problems of this nature, it is a clear advantage for Maine to have all the necessary personnel in close proximity.

The state solid waste management agency has been unable to make a significant contribution to the costs of the Auburn plant. No resource recovery grants program exists as yet in Maine. However, the Oil Pollution Control Division was able to fund the cost of a fourth 50 TPD incinerator, to be used as necessary for oil spill waste disposal. Auburn also will use this fourth unit for daily operations, producing steam from municipal refuse.

In contrast with the Maine DSWM, the California State Solid Waste Management Board (SSWMB) is able to provide funding for projects such as Auburn's. Grants in support of feasibility studies and preliminary design work have been awarded by the SSWMB to waste-to-energy projects in California. A second contrast between the states' agencies is seen when comparing their overall structure. While the Maine DEP, a single "umbrella agency," has jurisdiction over all environmental aspects of the Auburn project, a similar project in California would be accountable to the SSWMB, the Water Quality Control Board, a local Air Pollution control District, and several other state agencies. Differing regulations and the complexities of interagency communication, when brought to bear on Auburn's ash landfill/sewage treatment/sludge disposal problem, might cause the indefinite delay or failure of such a project in California.

PERMIT PROCESS

The permit process in Auburn, when compared with a similar project in California, has been exceedingly simple. The only permits required by the City were building and site permits; applications for these were made and granted "in-house." On the State level, the facility itself required an air emissions permit and a "solid waste energy recovery project" permit, each of which was granted within a few months of application. Ancillary permits for the ash landfill and the sludge landfill are pending at this time.

For a similar facility in California, the permit procedure could be quite a bit more complex, depending on the city, county, air basin or other region in which the project was located. Air emissions permit applications alone could add a year or more to the planning process. Presumably, several permit applications could proceed "in parallel;" however, the effort needed to coordinate quick and efficient permitting might require the half-time attention of, say, a city planning staff member for most of the multi-year period from initial planning through acceptance testing.

OTHER CONSIDERATIONS

Local Citizen Use

The Auburn facility will receive waste from local citizens in a four-bay enclosure separate from the main building. Based on our own experience in transfer station design in California, two or more additional bays would be needed to avoid traffic problems on the weekend for a California facility serving the same size population.

Financing

There is no California financial authority directly comparable to the Maine Municipal Bond Bank.

Waste Composition

In California, it is uncommon for a municipality the size of Auburn to have such a large industrial component. The commercial waste present in Auburn might be replaced in California by agricultural, light commercial, or residential waste, with a possible loss of heating value. Simple changes in facility design or operation might compensate for such a loss in heat content.

Waste Control

Auburn has signed contracts with many of the surrounding communities for delivery of their refuse to the Auburn plant. In the past, waste collection in the Auburn region has been more informal, to say the least. Franchised haulers generally made an oral agreement with a town as to the waste disposal site. In the past, with each town served by its own dump site, this has been straightforward. The requirement to haul a greater distance to Auburn may need to be reinforced by a written commitment from the hauler. In California, or for any new facility, regardless of location, it is likely that project underwriters would require firm assurance of delivery of wastes.

CHAPTER 6 - PROJECT EVALUATION

PROJECT BENEFITS

There are two clear benefits of the Auburn project. First, the landfill problem, as defined by state and federal regulations, is mitigated. Second, a principal industry in Auburn obtains a relatively inexpensive and stable source of energy. A potential benefit is the positive cash flow projected after five years of operation (see Table 3-2).

Other minor benefits anticipated from the project include reduced maintenance of Auburn refuse collection trucks, better control of waste (and the gathering of useful information) due to the weighing of incoming waste, a slight increase in employment, and improved protection of the Auburn water supply. Auburn will also enjoy the intangible benefit of civic pride in a unique accomplishment.

PROJECT-RELATED PROBLEMS

Uncertainty regarding the safety of landfilling ash from the facility is the principal project-related problem. The disposal of leachate is the primary cause for concern, as discussed in Chapter 4, Future Developments. Other less obvious problems include air quality measurement (comparison with earlier emissions from Pioneer will be necessary), waste control (informal arrangements with the Auburn area haulers may be inadequate), and project administration (the City lacks experience with an enterprise-type project). A secondary problem is the lack of staff members in the Maine DEP to provide sufficient technical support, evaluation, and regulation.

UNEXPLOITED OPPORTUNITIES

A future consideration for the Auburn plant is its use to co-dispose sewage sludge and refuse. Some sludge may be added to the refuse feedstock without jeopardizing steam production. The design of sludge handling facilities and the design parameters for a sludge feeding system have not yet been developed. When other alternatives for sludge disposal become so costly that co-disposal is a clear choice, then the necessary sludge storage and handling equipment will be chosen. Delay could be avoided by beginning this process now.

Pioneer Plastics views the project as an opportunity to dispose of some hazardous wastes at low cost. The effectiveness of the Consumat units in accomplishing this disposal has not yet been established; in fact, the relatively low temperature within the units gives reason to doubt their effectiveness. If, however, these incinerators will serve to dispose of hazardous waste, then the benefits to Pioneer will be appreciable, as there are few, if any, hazardous waste disposal sites within an economical haul distance of Auburn.

HINDSIGHT EVALUATION

When posed the question, "If the project were to begin again, what would you do differently?" participants uniformly stated that they would speed up the planning process. The newness of the technology was a hindrance; Auburn sought to understand it fully, and to evaluate all proposed systems thoroughly and fairly. LOF Plastics, the parent company of Pioneer Plastics, added further delays by introducing complications during negotiation of the steam purchase contract. It should be noted, though, that improvements in the modular combustion technology which occurred during the delays probably resulted in Auburn obtaining a better system.

Two physical aspects of the plant that will be corrected in future facilities are the placement of the truck scale (too close to the main building) and the incinerator primary chamber supports (a difficult two-piece field construction job). On the whole, both the City and Consumat are satisfied with the facility design and construction.

APPENDIX A - FIELD INSPECTION NOTES

GENERAL QUESTIONS

- Background: What was the problem that provided impetus?

two problems:

- 1) impending closure of landfills for Maine towns
- 2) uncertain price and availability of fuel oil for Pioneer Plastics

- Benefits of the project?

reduction of waste volume
production of energy
less costly disposal for Auburn region
security of City water supply

- Does it solve the problem?

yes - both problems

- Does it cause any other problems?

landfilling of ash

- If the same project were begun today, what would differ?

planning process speeded up

- Role of State Solid Waste Agency?

licensing

- Local governments - how cooperative?

most surrounding communities were aloof at first (exception: Regional Solid Waste Commission members). As project took shape, interest rose.

- Waste Supply - how obtained?

agreements between Auburn and surrounding communities (private haulers are directed by towns to disposal site)
City of Auburn
Pioneer Plastics

- Unexploited opportunities for energy/material recovery?

co-disposal with sludge
hazardous waste disposal
metals, glass, corrugated, tires

- Critical factors in development of the plant.

Obstacles: citizen objection, institutional barriers

Contract revision by LOF Plastics

Boosts: new legislation, citizen support, corporate backing

EPA technical assistance program
Pioneer Plastics

PLANNING - STUDIES

1) Title	By	Cost	Fund Source
Opportunities for Regional Solid Waste Management	A.D. Little	\$30,000	Regional Solid Waste Committee member communities
Solid Waste Management - A Progress Report	Auburn	5,000	City of Auburn
Strategy Options for Auburn	DSI	40,000	EPA Technical Assistance Program

2) Alternatives Investigated

Continued Landfill
Regional Landfill

Co-Disposal w/Sludge
Modular Combustion

3) Wastes Considered

Type	TPY	Avg. TPD
Auburn MSW	20,800	80
Pioneer Plastics	5,200	20
Other communities' MSW	26,000	100

4) Technology Recommended: modular incineration

Reason: least - cost solution with energy product

5) Future Considerations

2-5 years

Waste Increase: minor increase expected

Disposal Methods: run facility 7 days with tighter maintenance schedule

5-15 years

Waste Increase: unknown

Disposal Methods: City is willing to consider capitalizing a 4th unit

PLANNING - GENERAL

1) Risk Allocation

<u>Type of Risk</u>	<u>Entity Assuming Risk</u>	<u>How Assumed</u>
Waste Supply	City	Agreements with towns
Energy Market	Pioneer Plastics	Take-or-Pay
Disposal of Residuals	City	Ash landfill operation
Facility Construction	Consumat	Contract
Facility Operation	Consumat/City	Contract
Debt Service	City	G.O Bond

2) Impetus

Disposal Problem
Energy Demand

3) Citizen Participation

Committees (formed or existing)
Regional Solid Waste Committee

Local governments involved
Auburn, New Gloucester, Pineland Hospital, Minot, Mechanics Falls,
Poland, Center Lovell, Mexico, Lisbon Falls, Gorham, Naples, Raymond

Public Meetings: Number, Sponsor, Purpose
2-3 meetings sponsored by City to inform citizens
Largest meeting was attended by 4 or 5 households (100 invited)

Citizen Complaints
No complaints (not yet operating)
Concerns: Blowing trash on road to facility; burning of asbestos

4) Recycling Programs - Prior, Existing and Planned

Type	Material	Tonnage	Market	Price (Date)	Contract
Paper			Cellulosic		
Drives			Insulation		
			Manufacturer		

5) Anticipated Effect of Recycling Program on Energy or Material Recovery

None

6) Site Selection

Procedure: Deeded by Pioneer Plastics for \$1.00

Public Involvement: Minimal

Barriers: Minimal

OPERATION

1) Feedstock

Composition (est.)

Newsprint: 12%

Plastic: 1%

Corrugated: 1%

Other Org: 55%

Ferrous: 7.5%

Aluminum:

Non-Ferrous: 1.5%

Glass: 9%

Inerts: 3%

Heat Value

4,500 BTU/lb

2) Throughput

Min

Avg

Max

Design

175 TPD
or more

200 TPD

3) Energy Output (note variability)

% Availability

Steam: 150,000-160,000 lb/hr

@ T(60°F supheat), P (295 psig)

4) Materials Outputs

Type

Design

Flow Rate (TPD)

Actual

None

5) Residuals (indicate point of removal from process flow)

Type

Flow Rate

Disposal Cost

Distance to
Disposal Pt.

Ash

100 TPD

Approx. \$10/ton

5 min.

Unprocessibles taken to private salvage yard

Yard waste and inert debris taken to alternate City site

6) Plant Energy Use

Equipment Item

Energy Demand

From Internal Sources: Office heat

From External Sources: Fans, Hydraulic
Space heat

7) Process Flow (corrected diagram; attach; include gas conditions where known)

See Figure 2-4

8) Modifications	<u>Description</u>	<u>Cost</u>	<u>Reason</u>
Completed	N/A		
In Progress	N/A		
Planned	N/A		

9) Maintenance	<u>Requirement</u>	<u>Interval</u>
	Cleanout Inspection	Weekly
	Refractory Replacement	5 year

10) Traffic	<u>Mon - Fri</u> <u>Avg</u>	<u>Sat & Sun</u> <u>Avg</u>
General Public	3-4	50
Collection	12-14	0

FINANCE

- 1) Project Initial Cost: See Table 3-1
- 2) Annual Operating Costs: See Table 3-2
- 3) Annual Revenues: See Table 3-2
- 4) Financing

Amount	Type*	Term (Dates)	Conditions	% Construction % Non-Construct.
\$3.4 million	G.O.	20 yr.		100% Const.

Reasons for Choices

Bond Counsel advised that Revenue Bonds would not sell
Maine Bond Bank chosen to avoid bond marketing costs

Preparation Entities	Firm(s)	Cost	Time (Dates)
Financing Consultant			
Bond Counsel	Palmer & Dodge		
Underwriter	Maine Municipal Bond Bank		
Prospectus	None		
Cash Flow Projection	See Table 1-2		
Plant Life	20 yr.		
Salvage Value	None Assumed		

* GO, Rev, Lease/Rev, IDB, Lev. Lease, other

5) Funds Spent Prior to Releasing Bonds

See Table 3-1

6) Procurement Process

Cost: \$3.9 million
 Procuring Entity: City of Auburn, Dept. of Public Works
 Dates (From - To):
 Bids accepted February 1978; construction begun October 1979

7) Acquisition Approach

Turnkey (Modified)

8) Markets

Rate (Date) Escalation Terms

See Chapter 3 for rate equation, terms

9) Tipping Fee

Before Project

After Project

Due to new regulations, prior and new disposal costs are not comparable

10) Method of Charging Disposal Cost to Users

Through tax base

11) Waste Supply Agreements (* denotes original RSWC members)

<u>Descriptions</u>	<u>Supplier</u>	<u>Dates</u>
MSW	Auburn*	startup +20 yr.
Plastics waste, refuse	Pioneer Plastics	"
MSW	New Gloucester*	"
"	Center Lovell*	"
"	Mexico*	"
"	Pineland Hospital	?
"	Lisbon Falls*	startup +20 yr
"	Minot	?
"	Mechanic Falls	startup +20 yr
"	Gorham	"
"	Poland	"
"	Naples	"

PERSONNEL

1) Operating Crew (3 Shifts per Day, 5 Days per Week)

Classification	Number (All Shifts)
Foreman	3
Primary Operator	3
Secondary Operator	3

2) Maintenance Crew (1 Shifts per Day, 5 Days per Week)

Classification	Number (All Shifts)
Maintenance Mechanic	2

3) Support Personnel (1 Shifts per Day, 5-6 Days per Week)

Facility Manager
Scale Operator

4) Training Program

Foreman to hold boiler operator license
Initial training during shakedown

5) Background of Management

N/A

6) Safety Record: N/A

7) Union(s)

Closed or Open Shop
Non-Union planned

Negotiation History
City services only recently joined Teamsters

8) Average or Typical Term of Employment

Operations Personnel
N/A

Maintenance Personnel
N/A

ENVIRONMENTAL CONSIDERATIONS

1) Permits (Loc., St., Fed.)

	<u>Type</u>	<u>Agency</u>
- To Construct	Site Building	City City
- To Operate	Solid Waste Air Emission	State Dept. State Dept.

Starting Date for First Permit: July 1977

Completion/Renewal Date for Last Permit: N/A

2) Exhaust Gases	<u>Source</u>	<u>Flow Rate</u>	<u>Control Measures</u>
	Main Stack		Baghouse

Pollutant Concentration Data - not yet measured

3) Wastewater

<u>Source</u>	<u>Flow Rate</u>	<u>Control Measures</u>	<u>Receiving Body/System</u>
Ash sump	Negligible	None	City sewer

Pollutant Concentration Data - not yet measured

4) Noise Measurements (Interior & Exterior) - not yet measured

5) Odor - not yet measured

6) Aesthetics - acceptable

APPENDIX B - BIBLIOGRAPHY

LIST OF REFERENCE DOCUMENTS

ARTICLES

- Waste Age, August 1980
- 1980 ASME Proceedings

MAPS

- Minor Civil Divisions, State of Maine
- Lewiston-Auburn
- Towns Involved in Solid Waste Program

STUDIES

- Opportunities for Regional Solid Waste Management
Arthur D. Little May, 1975
- Solid Waste Management - A Progress Report
Auburn DPW, Eng. Div. March, 1977
- Strategy Options for Auburn - DSI June, 1977
- Evaluation Report - Auburn Solid Waste Energy
Auburn Solid Waste Review Committee July, 1978
- Reviews and Evaluation - Camp, Dresser & McKee October, 1978
- Technical Assistance to the City of Auburn
USEPA Region I November, 1978
- Co-Processing Sewage Sludge with MSW
Consumat Systems, Inc. March, 1980
- Sludge Drying and Combustion Alternatives
Camp, Dresser & Mc Kee (CDM) April, 1980
- Technical Monitor's Comments on CDM Study
York Research Corporation July, 1980

PROPOSALS

- Waste Management, Inc. February, 1978
- see also STUDIES, March, 1977

PLANS/SPECS

EIR/EIS/Negative Declaration
none

PERMITS & REGULATIONS

- Air Quality: regs, permits, related correspondence, proposed state solid waste regulations
- Ash Landfill/Energy Recovery Project: permits, correspondence
- Hazardous Waste Incineration: correspondence
- City building and site permits

PROSPECTUS
None

LETTERS OF INTENT

- Pioneer Plastics August, 1978 & July, 1979

CONTRACTS

- | | |
|---|-------------------|
| • Auburn Solid Waste Energy Recovery Contract | October 4, 1979 |
| • Supplementary Agreement | October 9, 1979 |
| • Oil Spill Waste Facility Use Contract | March 11, 1980 |
| • Waste Supply Agreement (Poland) | November 20, 1979 |
| • Waste Supply Agreement (New Gloucester) | 1980 |

GRANT APPLICATIONS & GRANTS

none

FINANCING, OTHER

- Life-cycle cost table
- Bond payment schedule

OTHER

- Correspondence from Morrison re: codisposal studies

ANNOTATED BIBLIOGRAPHY

Larochelle, L., "Full-Steam Ahead on Auburn Project," Waste Age, vol. 8, no. 11 (August, 1980), p. 36.

A thorough overview of the Auburn project, with emphasis on terms of the Auburn-Pioneer and Auburn-Consumat contracts. An effective "executive summary" of the project.

Larochelle, L., and Gershman, H., "Resource Recovery and Co-disposal in Auburn, Maine," Proceedings of 1980 National Waste Processing Conference, ASME, New York.

Content of this article is virtually identical to the aforementioned Waste Age article.

Arthur D. Little, Inc., "Opportunities for Regional Solid Waste Management," prep. for the Regional Solid Waste Committee for Auburn, Maine and vicinity, May, 1975.

This is the initial study done for Auburn. Four alternatives are identified:

- 1) sanitary landfill (upgraded from then-existing open dumps)
- 2) steam recovery via incineration
- 3) resource recovery (pelletized fuel and materials recovery)
- 4) transportation (transfer)

These alternatives are compared on the bases of cost, environmental impact, flexibility, and social and political impact. Implementation strategies are discussed.

Auburn Public Works Department, "Solid Waste Management - A Progress Report," March, 1977.

This report was prepared for the Auburn City Council and other interested parties, to summarize progress on the project and to indicate the next step. It provided a framework of information to support the decision to pursue energy recovery.

The steam agreement between North Little Rock and Koppers, and preliminary proposals from Consumat and other vendors are provided.

Development Sciences, Inc., "Strategy Options for the City of Auburn, Maine, Energy Recovery Project," June, 1977.

This document states a variety of possible terms and conditions that could be written into an operating agreement for the Auburn facility. The pros and cons of public vs. private ownership are reviewed, and critical decisions are briefly listed. Methods by which the City might assume, share, or avoid risk in the key areas of project economics, financing, market, systems performance, and waste supply are tabulated.

City of Auburn, Maine, Auburn Solid Waste Review Committee, "Auburn Solid Waste Energy Recovery Project: Evaluation Report," July, 1978.

Each of the six proposals for the facility is briefly discussed. The top three, Consumat, WMI, and Envirotech, are described and evaluated in detail. The Consumat proposal is shown to best fit the City's needs, but the WMI proposal would have been acceptable. The option to co-dispose of sewage sludge and solid waste is addressed.

Camp, Dresser & McKee, Inc., "Review and Evaluation, Auburn, Maine Solid Waste Energy Recovery Project," October 26, 1978.

This report evaluates both the Auburn RFP and Consumat's response. Changes are suggested to the proposed sludge drying equipment arrangement to improve the performance, and to building size and design, in order to reduce cost. It is pointed out that escalation of construction costs may than offset the savings obtained by design changes.

U.S. E.P.A. Region I And Gordian Associates, Inc. "Energy Recovery from Solid Waste: The Auburn, Maine Experience," November 3, 1978.

The involvement of the USEPA Technical Assistance Program is described in this report. The section, "Summary of Lessons Learned," is of particular interest as it was written prior to construction. Lessons learned at this early stage included:

- 1) the lack of experience with this technology delayed implementation
- 2) economic projections were of great value in evaluating proposals
- 3) risks are there, and should be shared by energy producer and consumer

The report is written more to describe and evaluate the contribution of the Technical Assistance Program than to describe the Auburn project.

Consumat Systems, Inc., "Evaluation of the Feasibility of Co-processing Sewage Sludge with Municipal Solid Waste" (final report: prepared for the City of Auburn, Maine), March 10, 1980.

The technical feasibility of co-disposal is established, relying in large part on a series of tests at the North Little Rock waste-to-energy facility, which also uses Consumat equipment. Curves relating the feed rates of solid waste and sludge to steam production are presented. Appendices include analyses of sludge and of particulate emissions generated during testing at North Little Rock.

Camp, Dresser & McKee, Inc., "Auburn Maine Energy Recovery Facility Feasibility Study: Sludge Drying and Combustion Alternatives," April, 1980.

This report takes a close look at Auburn-Lewiston sludge quantities and percent solids. Wide variation is found in both. Sludge storage is thought to be necessary for steady feed to a co-disposal system. CDM recommends that testing, similar to

that performed by Consumat in North Little Rock, be done in Auburn prior to a decision regarding co-disposal. CDM further recommends that sludge storage and feeding be demonstrated at Auburn once the facility is operable.

Various co-processing and dewatering processes are described.

The principal conclusion stated in this report is that co-disposal would cost at least twice as much as landfilling of sludge, on a per-dry-ton basis. Co-disposal is, therefore, not recommended.

York Research Corp., "Comments on the Report Entitled 'Auburn, Maine Energy Recovery Facility Feasibility Study: Sludge Drying and Combustion Alternatives' prepared by Camp, Dresser & McKee," July 31, 1980.

York acted as technical monitor, reviewing CDM's co-disposal study. They do not concur with CDM's recommendation to eliminate co-disposal from consideration. They suggest the investigation of other alternatives for preparation of the sludge cake. The small number of sludge samples taken by CDM is pointed out. Overall, York raises sufficient questions about the CDM report to preclude its being taken at face value.

Waste Management, Inc., "Proposal for City of Auburn, Maine, Energy Recovery Project," February, 1978.

- executive summary
- proposal
- annual report

The WMI proposal calls for as many as nine Sunbeam Comtro modular incinerators. Co-disposal is not considered viable. Proposed capital cost is \$6.9 million for a 200 TPD facility (January 1978 dollars).

State of Maine, Dept. of Environmental Protection, "Protection and Improvement of Air: Annotated Maine Revised Statutes - Title 38, chapter 2 (in part) and 4; Title 29, chapter 13; Regulations," September, 1979.

Chapter 104 of these statutes gives the particulate emissions rate for an incinerator designed to handle 50 tons per day (or less) as 0.2 grains per standard cubic foot. For larger incinerators, the rate is 0.08 gr/scf.

Chapter 108 states general emissions license regulations. Accompanying this document are copies of the air emissions permit for the facility, and of correspondence related to that permit.

State of Maine, Dept. of Environmental Protection, "Proposed Solid Waste Management Regulations," memorandum from R. Neily, August 26, 1980.

These regulations cover both the Auburn facility and its associated ash landfill. The new regulations would differ very little from those presently in effect, with respect to the Auburn project.

Copies of permits and related correspondence concerning the interim landfill, the ash landfill, and the processing facility are included.